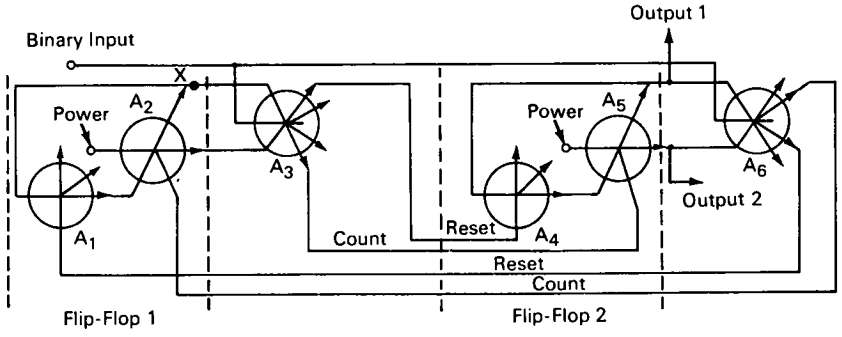
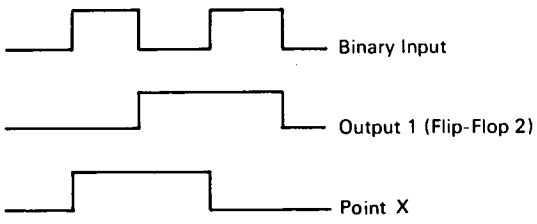
NASA TECH BRIEF

Binary Counter Uses Fluid Logic Elements



COUNTER SCHEMATIC



FLUID PULSE WAVEFORMS

The problem: To design a binary counter using fluid logic elements. Each stage of the counter must produce one output pulse for each two input pulses.

The solution: A binary-counter stage consisting of two fluid flip-flops, each of which contains three fluid logic elements. The binary output is taken from the output of the second flip-flop.

How it's done: Each flip-flop is constructed from a fluid amplifier (A_2,A_5) and a two-input, three-output element (A_1,A_4). The flip-flops are interconnected by the three-input, four-output elements (A_3,A_6). When the binary input is low (that is, when there is no fluid pulse), A_3 controls the state of flip-flop 2; when the binary input is high (that is, when there is a fluid pulse), A_6 controls the state of flip-flop 1.

Initially (that is, when there is no binary input), A_3 produces a reset pulse which does not affect flip-flop 2, since both flip-flops are in the reset state. When the binary input goes high, the A_3 reset is removed from flip-flop 2. Element A_6 produces a count pulse which switches flip-flop 1 into the count state. The count pulse from A_3 has no effect on flip-flop 2 because element A_5 has been locked on by A_4; therefore, flip-flop 2 remains in its initial state. When the binary input reverts to low, the count pulse from A_3 switches flip-flop 2 to its opposite state.

(continued overleaf)

When the binary input goes back to high, the A_3 count pulse is removed, and A_6 sends a reset pulse to flip-flop 1, switching its state. When the binary input goes back to low, A_3 sends a reset pulse to flip-flop 2, switching its state. In this way, the flip-flops switch their state once for every two changes in the binary input.

Note: Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama, 35812
Reference: B65-10377

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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